SUPPORTING FRAME FOR A UTILITY VEHICLE

The invention relates to a supporting frame for a utility vehicle, in particular a tractor unit, having a front part, a center part and a rear part.

German Laid-Open Specification DE 43 22 716 A1 discloses a supporting frame for utility vehicles which is composed of three different sections, namely a front part for fitting the front axle region, a center part, and a rear part for fitting the rear axle. The front part and the rear part are each composed of longitudinal member segments connected to cross members, the longitudinal member segments being designed as aluminum castings with numerous ribs. The center part has a box-shaped cross section, the two side walls of the center part assuming a supporting function and being composed of extruded aluminum profiles. Provision is made for the three different sections to be preassembled as modules, and for all the components which are to be fastened to the supporting frame to be arranged on the corresponding sectional frame before the sectional frame is connected. The longitudinal member segments in the front part and rear part have an H section.

German Patent DE 101 48 312 C1 discloses a supporting frame for a chassis of a utility vehicle, this supporting frame having a box-shaped cross section over its entire length. The supporting frame is composed of two top chords, two bottom chords and thrust plates connecting said chords to one another. The bottom chords may be of three-piece design, so that each bottom chord has a front piece, a center piece and a rear piece. The drive train and if need be further components may be installed in the interior space of the box-shaped supporting frame.

A further supporting frame for utility vehicles with a box-shaped cross section over its entire length has been disclosed by German Laid-Open Specification DE 197 50 981 A1.

A supporting frame for a utility vehicle has been disclosed by German Laid-Open Specification DE 101 37 379 A1, this supporting frame having a box-shaped cross section and being composed of in each case two top chords and two bottom chords and vertical webs connecting the top chords and bottom chords to one another. The two top chords and the two bottom chords are likewise connected by means of webs. The webs are arranged in such a way that a reinforcing frame closed all round is obtained.

The invention is intended to provide a supporting frame for utility vehicles which, compared with conventional supporting frames, provides more space for accommodating functional elements, for example exhaust gas cleaning systems and fuel tanks.

To this end, according to the invention, a supporting frame for a utility vehicle, in particular a tractor unit, having a front part, a center part and a rear part, is provided in which the center part is of latticework-like construction with at least two top chords and two bottom chords and forms a box-shaped cross section as viewed in the longitudinal direction of the vehicle, and in which the front part and the rear part are of ladder-frame-like design with a right-hand and a left-hand longitudinal member, the longitudinal members having a U-like cross section as viewed in the longitudinal direction of the vehicle.

Compared with conventional supporting frames, the latticework-like design of the center part of box-shaped cross section results in more space for accommodating, for example, exhaust gas cleaning systems and fuel tanks. As a result, due to the supporting frame according to the invention, future exhaust

gas regulations for utility vehicles can be fulfilled without reducing the fuel tank volume. On the other hand, the front part and the rear part are constructed in a proven manner with longitudinal members of U-like cross section, so that proven engine, rear-axle and front-axle fastenings can be used.

In a development of the invention, in the front and rear part, the legs of the longitudinal members of U-like cross section in each case extend in the direction of the opposite longitudinal members, and the top chords and/or bottom chords lying at the longitudinal edges of the center part have an L-like cross section as viewed in the longitudinal direction of the vehicle.

By virtue of the fact that the top chords and/or bottom chords in the center part have an L-like cross section, as much space as possible is provided inside the box-shaped cross section of the center part for the installation of functional elements.

In a development of the invention, a first leg of the top chords and/or bottom chords of L-like cross section runs parallel to a base of the respectively associated longitudinal member of the front part and/or rear part, and a second leg of the top chords and/or bottom chords extends outward from the base of the respectively associated longitudinal member in the opposite direction to the legs of the longitudinal members.

Due to such an arrangement, the space inside the box-shaped cross section of the center part can be utilized more effectively. Nonetheless, a robust supporting frame is ensured.

In a development of the invention, an essentially triangular thrust plate for connecting the top chord, the bottom chord and the respectively associated longitudinal member of one side is provided.

For example, a triangular thrust plate having a central aperture may be selected, so that a robust connection of top chord, bottom chord and longitudinal member is possible on the one hand and material and weight are saved on the other hand.

In a development of the invention, the top chords and bottom chords of one side, the two opposite top chords and/or the two opposite bottom chords are in each case connected to one another by means of thrust plates.

The selection of thrust plates enables as large a useful space as possible to be provided inside the center part of box-shaped cross section. For example, thrust plates of a lightweight type of construction may be selected in order to keep down the overall weight of the supporting frame.

In a development of the invention, the bottom chords, at least in the region of the rear end of the center part, are connected to one another by means of a portal member which is U-like as viewed in the longitudinal direction of the vehicle and is open downward.

By means of such a portal member, a robust connection of the two bottom chords is provided on the one hand and the space for the spring deflection and rebound movements of a cardan shaft is provided on the other hand.

In a development of the invention, the portal member, in its top region opposite the bottom chords, is connected to a cross member of the front part or rear part.

In this way, a connection to the front part or rear part is achieved which is simple in terms of design and is at the same time robust.

In a development of the invention, a chassis fastening for the rear axle, in particular a stabilizer mount, is arranged in

the region of the rear end of the bottom chords of the center part.

The arrangement of a chassis fastening in the region of the rear end of the bottom chords of the center part has the advantage that the rear end of the bottom chords is located essentially at axle level. Compared with conventional supporting frames, in which complicated struts have to be provided in order to provide an articulation point at axle level, construction cost and weight can therefore be saved. Specifically in the case of a stabilizer mount in which, according to the invention, only one mounting stirrup has to be fastened to the rear end of the bottom chords, a considerable weight saving is obtained compared with a conventional design in which a robust member has to extend from the longitudinal member down to approximately axle level.

Further features and advantages of the invention follow from the claims and the description below of a preferred embodiment of the invention in connection with the drawings, in which:

Fig. 1 shows a perspective exploded illustration of the supporting frame according to the invention,

Fig. 2 shows the supporting frame of Fig. 1 in the assembled state, and

Fig. 3 shows the supporting frame according to the invention and provided with functional elements, in an exploded illustration.

The supporting frame 10 according to the invention and shown in Fig. 1, for a utility vehicle, is intended in particular for a tractor unit. As viewed in a forward travel direction 12, the supporting frame 10 has a front part 14, a center part 16 and a rear part 18.

The front part 14 is constructed in a conventional manner per se and, as viewed in the forward travel direction 12, has a right-hand longitudinal member segment 20, a left-hand longitudinal member segment 22 and a cross member 24 connecting the two longitudinal member sections 20, 22. The two longitudinal member segments 20, 22 are each designed in the shape of a U profile with a base and two legs starting from the base and extending in the same direction. In this case, the U-profile-shaped longitudinal member segments 20, 22 are arranged in such a way that the legs of the longitudinal member segments 20, 22, starting from the base, each extend in the direction of the opposite longitudinal member segment 20, 22.

The rear part 18 is likewise composed in a conventional manner per se of a right-hand longitudinal member segment 26, as viewed in the forward travel direction 12, a left-hand longitudinal member segment 28 and two cross members 30, 32. Like the front part 14, this also gives the rear part 18 a ladder-frame-like construction. The longitudinal member segments 26, 28 of the rear part 18 are likewise designed in the shape of a U profile and are oriented relative to one another in the same way as the longitudinal members segments 20, 22 of the front part 14.

As viewed in the forward travel direction 12, the center part 16 has a right-hand top chord 34, a left-hand top chord 36, a right-hand bottom chord 38 and a left-hand bottom chord 40. The top chords 34, 36 and the bottom chords 38, 40 each have an L-shaped cross section as viewed in the longitudinal direction of the vehicle and are each bent transversely to the longitudinal direction of the vehicle in order to be able to be adapted to the different frame widths of the front part 14 and of the rear part 18.

In their center region, the two top chords 34, 36 are connected to one another by means of a thrust plate 42 in a

lightweight type of construction. In the same way, the right-hand top chord 34 and the right-hand bottom chord 38 are connected to one another by means of a further thrust plate 44 in a lightweight type of construction, and the left-hand top chord 36 and the left-hand bottom chord 40 are connected to one another by means of a further thrust plate 46 in a lightweight type of construction. The thrust plates 42, 44 and 46 result in reinforcement in the center region of the center part 16, this reinforcement running around three sides of the box-shaped center part 16. However, the center part 16 remains open toward the underside. As a result, for example, sufficient space is available for the spring deflection and rebound movements of a cardan shaft.

In the front region of the center part 16, the right-hand bottom chord 38 and the left-hand bottom chord 40 are connected to one another by means of a cross member 48. At the level of the cross member 48, the right-hand bottom chord 38 and the right-hand top chord 34 are connected to one another by means of a rear leg of a triangular thrust plate 50, and in the same way, on the opposite side of the center part 16, the left-hand top chord 36 and the left-hand bottom chord 40 are connected by means of a leg of a further triangular thrust plate 52. In this case, the triangular thrust plates 50 are arranged at the front end of the center part 16 in such a way that a further leg in each case runs parallel to the right-hand top chord 34 and the left-hand top chord 36, respectively, and constitutes their extension beyond their respective front end. The two legs of the triangular thrust plates 50, 52 are in this case arranged at a right angle to one another, and a connecting strut of the triangular thrust plates 50, 52 runs at an angle of about 45° to the two legs and connects their ends. The construction of the triangular thrust plates 50, 52 with two legs and a connecting strut is produced in this case by the provision of a triangular central aperture in the thrust plate 50, 52. The center part 16 is connected to the front part 14 by the two

top chords 34 and the top legs of the triangular thrust plates 50, 52 being overlapped with and connected to the base of the respectively associated longitudinal member segments 20, 22.

At the rear end of the center part 16, the right-hand top chord 34 and the right-hand bottom chord 38 are connected to one another by means of a triangular thrust plate 54 which is of identical construction to the thrust plates 50, 52 already explained. The left-hand top chord 36 and the left-hand bottom chord 40 are also connected to one another in the region of the rear end of the center part 16 by means of a further triangular thrust plate 56 which is likewise of identical construction to the thrust plates 50, 52 already explained.

The arrangement of the rear triangular thrust plates 54, 56 is in this case selected to be the same as the arrangement of the front thrust plates 50, 52, so that, at the two rear thrust plates 54, 56, the connecting strut arranged at an angle to the top chords 34, 36 and the bottom chords 38, 40 also faces the front in each case with respect to the forward travel direction 12.

In addition, in the region of the rear end of the center part 16, the two bottom chords 38, 40 are connected to one another by means of a U-shaped portal member 58. The provision of the portal member 58 firstly creates a robust connection of the rear ends of the bottom chords 38, 40 and at the same time provides sufficient space for the spring deflection and rebound movements of the cardan shaft. As can be seen from Fig. 2, the top section of the portal member 58 is connected to the cross member 30 of the rear part 18 in the assembled state.

In addition, in the region of the rear ends of the bottom chords 38, 40, in each case a stabilizer mount 60 is provided on the outer side of the bottom chords 38, 40. The stabilizer

mounts 60 are each of stirrup-shaped design, the intention being for a respective stabilizer link for the rear axle to be accommodated in the stirrup.

As can be seen from Figs 1 and 2, the individual components of the supporting frame are riveted or screwed to one another. To this end, numerous through-holes are provided in the individual components.

From Fig. 2, which shows a perspective view of the assembled supporting frame 10 of Fig. 1, it can be seen that the right-hand top chord 34 and the right-hand longitudinal member segment 20 of the front part 14 overlap one another and are fastened to one another in the region of this overlapping. Together with the connection of the triangular thrust plate 50 to the right-hand top chord 34, the right-hand longitudinal member segment 20 and the front end of the right-hand bottom chord 38, an extremely robust connection of the center part 16 to the front part 14 is obtained. The opposite connection of the left-hand top chord 36 to the left-hand longitudinal member segment 22 of the front part 14 is executed in an analogous manner.

In the region of the connection between the center part 16 and the rear part 18, the right-hand top chord 34 and the right-hand longitudinal member segment 26 of the rear part 18 overlap one another and are fastened, for example riveted or screwed, to one another in the region of this overlapping. The top leg of the triangular thrust plate 54 essentially completely covers the region of the overlapping between the right-hand top chord 34 and the right-hand longitudinal member segment 26 and is connected, for example riveted or screwed, to the top chord 34 and the right-hand longitudinal member segment 26 of the rear part 18 in the region of the overlapping. Together with the connection of triangular thrust plate 54 to the rear end of the right-hand bottom chord 38, an extremely robust connection of the center part 16 to

the rear part 18 is obtained as a result. On the opposite side, the left-hand top chord 36, the left-hand longitudinal member segment 28 of the rear part 18 and the rear end of the left-hand bottom chord 40 are connected to one another in the same way by means of the triangular thrust plate 56.

The schematic, perspective view of Fig. 3 again shows the supporting frame 10 according to the invention in an exploded illustration, some functional elements already being installed in the front part 14 and the rear part 18. As becomes clear from the illustration in Fig. 3, the front part 14, the center part 16 and the rear part 18 can thereby be preassembled as modules and can then be put together in the preassembled state to form the supporting frame 10. As a result, the production times can be markedly reduced and the accessibility during the fitting of the individual functional elements is improved.

Specifically, according to the illustration in Fig. 3, a drive unit 62 with transmission 64 is installed in the front part 14. Furthermore, a front axle, for example, could be attached to the front part 14, and only then would the latter, with attached front axle, be put together with the center part 16 and the rear part 18.

In the illustration in Fig. 3, a rear axle 66 is already attached to the rear part 18. Two stabilizer links 68 can readily be seen, which on the one hand are connected to the rear axle 66 and on the other hand are inserted into the stabilizer mount 60. The stabilizer links 68 run essentially at the level of the center of the rear axle 66, and consequently the stabilizer mounts 60 are also arranged approximately at the level of the center of the rear axle 66. As can be seen in Figs 1 to 3, the stabilizer mounts 60 are designed as compact stirrup-shaped mounting points. Compared with the conventional design of such stabilizer mounts, this permits a considerable saving of material and weight, since, in conventional supporting frames, the mounting points

likewise have to be arranged approximately at the level of the center of the rear axle 66, and consequently the stabilizer mount requires a member which extends from the right-hand or left-hand longitudinal member beyond the level of the center of the rear axle.

On the whole, the invention provides a supporting frame for a utility vehicle which, compared with conventional supporting frames, provides more space in the region of the center part 16 for accommodating an exhaust gas cleaning system and a fuel tank. Nonetheless, proven unit fastenings can be used in the region of the front part 14 and the rear part 18, since, in the region of the front part 14 and the rear part 18, the supporting frame 10 according to the invention is adapted in the ladder-frame-like type of construction per se, with right-hand longitudinal member segments 20, 26, left-hand longitudinal member segments 22, 28 and cross members 24, 30, 32 connecting said longitudinal member segments.